THE

AMERICAN JOURNAL

OF THE MEDICAL SCIENCES.

MAY, 1907.

ORIGINAL ARTICLES.

THE DIAGNOSIS AND TREATMENT OF CARDIAC DEGENERATION APART FROM VALVULAR DISEASE.

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CLINICALLY, cases of myocardial degeneration may be divided into two groups: (1) Those in which diagnosis is comparatively easy and certain and rests on good and sufficient data, which will be elaborated later on, and (2) those in which diagnosis is by exclusion or inference, such data as exist being few but often quite significant. In the first group symptoms of cardiac incompetence may or may not be present, but in this discussion they are presupposed. In the second group they are wanting or obscured by symptoms referable to structures other than the heart.

Group I. Age is highly important, for, although the myocardium may be comparatively healthy in exceptional instances up to advanced age, its degeneration grows progressively more probable with every year past middle life, and may be taken for granted when senility has been reached. Of importance also is a history of syphilis, chronic alcoholism, certain acute infections, as influenza, cholelithiasis, gout, lead or phosphorus poisoning, or any other of the agencies generally recognized to exert a malign influence upon the nutrition of the heart or arteries.

Symptoms of cardiac incompetence may possess great diagnostic value in connection with age, but when occurring in persons nearing forty years they must be considered suggestive rather than conclusive. In the latter event, due attention must be given to the history for the purpose of excluding the possibility of acute heart strain; and every endeavor should be made to detect some of the objective data soon to be mentioned.

Angina pectoris developing after the fiftieth year, and especially in connection with signs of cardiac hypertrophy or dilatation, suggests strongly coronary or aortic sclerosis, and hence degeneration of the myocardium. Precordial pain of a dull, oppressive character, coming on during exertion and usually associated with arterial hypertension, points to abnormal intracardiac blood pressure and chronic myocarditis. This is particularly true if the individual is in the middle period of life and if intercostal neuralgia can be excluded.

Breathlessness upon exertion in an individual past middle age, if not dependent upon emphysema or obesity, and many times even then, points to myocardial inadequacy; and if the dyspnœa displays the features of cardiac asthma coming on at night, there can be little if any doubt of degeneration of the heart muscle.

Vertigo is a very variable and equivocal symptom, but when associated with hypertension of the pulse may give early evidence of myocardial inadequacy; and cardiac insufficiency developing insidiously at or past the forty-fifth year should always arouse a suspicion of myocardial degeneration.

Another symptom, which in a suspected case always fills me with apprehension, is a peculiar combination of nervousness, anxiety, and air-hunger, the last being more subjective than objective perhaps. This syndrome is seen in connection with signs of cardiac dilatation, but to my mind indicates serious nutritional disturbance of the myocardium, and in three instances was soon followed by sudden death.

The objective data which warrant a diagnosis of cardiac degeneration are well known and need no elaboration. Signs of arteriosclerosis are generally held to be very significant, but may be pronounced in the arteries of the extremities without serious involvement of the aorta or coronary arteries. When, on the contrary, signs and symptoms denote extensive sclerosis of these latter vessels, serious degeneration of the heart muscle may be diagnosticated, and symptoms of incompetence are rarely wanting. These signs are moderate dulness in the right first interspace close to the sternum, a ringing and metallic or clanging quality of the aortic second tone, with or without a systolic murmur in the same area, and exaggerated pulsation of the subclavian arteries which arch high upward above the middle third of the clavicles. Under such circumstances the arch of the aorta is very likely to be thinned and dilated.

Bradycardia may occasionally possess diagnostic significance, but unless showing the Adams-Stokes peculiarity is not so important as is persistent acceleration of the pulse. Tachycardia is an especially valuable sign of myocardial feebleness if it becomes manifest upon exertion and is out of proportion to the degree of effort. Intermittence of the pulse may come and go in an elderly or aged individual without being an index to the state of the heart muscle, but habitual arrhythmia must be held to signify degeneration, especially of the auricles.

Increase in the area of deep-seated cardiac dulness is a highly important sign in the class of cases now considered; often the area can be shown to possess a quadrangular outline indicative of general hypertrophy with dilatation. It should be remembered, however, that marked increase is not always demonstrable, and hence careful measurements should be made in doubtful cases.

Auscultation may or may not yield valuable data, but in all cases of extensive degeneration I believe more or less evidence is to be obtained by close study of the heart tones. Weakness of the sounds in general is not so trustworthy, as a rule, as is a modification of individual tones. Thus the first tone at the apex may be short and valvular or muffled or accompanied by a short whiff of variable intensity (the murmur of muscular mitral insufficiency). The aortic second tone is very likely to be sharply ringing or clanging, and may be impure; it may be enfeebled when there is dilatation as well as hypertrophy of the left ventricle, and often the first aortic tone is accompanied or replaced by a bruit. Many times the pulmonic second tone is accentuated, especially when the left ventricle has begun to dilate and there is muscular mitral insufficiency.

In summing up it may be said that the diagnosis of chronic myocarditis is warranted if symptoms of cardiac incompetence develop in a person past middle age whose arteries and heart present clinical evidence of sclerosis, on the one hand, and of dilatation or hypertrophy with dilatation, on the other. If angina pectoris or that form of spasmodic, nocturnal dyspnœa, termed cardiac asthma, is present there can be no reasonable ground for doubt. But if chronic nephritis is associated and has led to high blood pressure or perchance dominates the scene, there may be much difficulty in deciding in how far the hypertension or the state of the heart muscle is responsible for the symptoms of cardiac inadequacy. There are, moreover, border-line cases, usually seen in persons nearing middle age, in which a positive diagnosis of myocardial degeneration is so difficult that it is better to be content with the diagnosis of cardiac incompetence, leaving the question of degeneration *sub judice*.

Group II. In this class are included those cases in which sudden death surprises an individual, who, although he has attained or passed middle life, yet has not dreamed there was anything wrong with his heart. It also comprises those elderly men who apply for life insurance, and not presenting symptoms of cardiac inadequacy, yet by reason of their years are naturally looked upon with suspicion.

In this group there are no distinctive symptoms on the side of the heart, else there would be no doubt of their real nature, or if perchance the breath comes a little less freely during exertion than it once did, this is attributed to the individual's portliness or sedentary habits. In some instances there are slight precordial pain and a sense of fulness which, being especially noticeable after eating, are attributed to indigestion. In most of these cases symptoms either are wanting or are so slight that they do not intrude themselves upon the subjective consciousness of the individual, who may be engrossed in large professional or mercantile affairs. The main fact that excites suspicion is his age, which presupposes the conclusion that his organs and tissues are no longer healthy. How, then, may one arrive at a diagnosis as regards his myocardium?

Either one must come to an opinion through exclusion of all other sources of the symptoms, provided such exist, or the physician must infer that because the applicant is fifty-five or sixty years old his myocardium cannot be any longer sound, and hence makes a diagnosis of chronic myocarditis on general principles, as it were. Not only is this unscientific, but it is unwise, since it may be possible for the subsequent long life of the individual to cast discredit on the correctness of the examiner's judgment.

Cases of this group test the skill and judgment of the physician and oftentimes leave him sorely perplexed. Very much depends upon the extent of deep-seated cardiac dulness which, therefore, must be determined with painstaking accuracy. It is not sufficient to conclude that because relative dulness reaches to and not beyond the left nipple it is normal. The transverse area must be measured, for if dulness is found to reach more than 9 or 10 cm. to the left of the median line at the level of the fourth rib it is increased, even though it does not pass outside the mammillary line.

If the individual is large-chested and percussion of the heart is correspondingly difficult and uncertain, much aid may be obtained by study of the aortic second sound. If this is especially loud and ringing, it may be held to denote either abnormal peripheral resistance or sclerosis of the aorta. In the former instance in particular, arterial tension is likely to be high, and hence hypertension of over 150 mm. Hg., taken in connection with an intense and ringing aortic second tone renders the conclusion of left ventricular hypertrophy almost inevitable and corroborates the conclusion based upon percussion; if hypertrophy is discovered after middle age, it warrants the inference of degeneration.

It is always well to auscultate these doubtful hearts immediately after some unusual exercise—as hopping, bending, stair-climbing, etc.—which has set the heart to beating violently. Not infrequently one will detect, under such circumstances, a faint, soft, yet distinct systolic blow at the apex which accompanies, but does not replace, the first tone. This is the murmur of muscular mitral insufficiency and indicates that the papillaries or some other portions of the muscular apparatus do not functionate perfectly, in consequence either of degeneration or of some degree of dilatation of the ventricle. Whatever its precise mode of production this murmur denotes that the ventricular wall is not equal to the strain to which it has been subjected.

If the individual is past forty years of age and displays marked arterial hypertension, especially if such increased blood pressure is associated with an impressively corpulent abdomen, the inference is justifiable that the myocardium is being overtaxed. Should the examination of the heart result at the same time in the detection of an increase in the area of deep-seated cardiac dulness, this finding should be taken to indicate not a large heart to fit a large body, but an actual hypertrophy; and when hypertrophy and hypertension co-exist there is degeneration of the wall in consequence of habitual overwork.

The difficulty of determining the question of whether or not chronic myocarditis exists is illustrated by the following case:

A man, aged fifty-three years, consulted me because of precordial pain, of an anginal character, which had come on at 9 P.M. a week before. He weighed 240 pounds, which, for his height of five feet eleven and a half inches, constituted veritable corpulence. His abdomen was particularly prominent, although panniculus adiposus was everywhere pronounced. The anginal seizure had required medical treatment and had recurred at intervals nearly all night. Since that time he had been conscious of a dull, oppressive substernal pain upon walking, but in other respects he considered himself well. Upon inquiry it was learned that in the afternoon immediately preceding his angina he had taken the eighth of a course of violent exercises intended to reduce his weight and had felt "completely done up." Examination of the heart was not easy on account of the thickness of the chest-wall, yet, by careful percussion, it was possible to determine general increase in the area of deep-seated dulness, especially to the left. The heart sounds were feeble and in particular the aortic second tone was not ringing. At the apex the first sound was short and valvular and accompanied by a faint whiff which, in the dorsal decubitus, became distinctly blowing. Systolic blood pressure taken with a Janeway apparatus registered 138 mm. Hg., and the pulse rate was between 90 and 100.

Here was a corpulent man, of fifty-three years, who presented evidence of cardiac dilatation that had resulted from strain and who gave a history of angina pectoris. The queries naturally arose, Was heart strain the only condition, or was there an underlying degeneration? did the attack of angina lend support to the latter inference, or was it due to the dilatation and not to coronary sclerosis? The answer to these questions was by no means easy and had to be found by inference and not positive data.

There was no evidence of arterial thickening and the aortic second tone was not ringing and accentuated. But blood pressure was

138 mm. Hg., the abdominal corpulence was marked, and, moreover, the heart walls had yielded to a degree of physical exertion which they ought to have endured without lasting ill effects had the myocardium been perfectly sound. Furthermore, the initial symptom had been angina and not dyspnœa. On the whole, therefore, it seemed reasonable to assume more or less degeneration as a result either of obesity or of chronic strain incident to sclerosis of the intra-abdominal vessels and increased blood pressure. Pulse tension was not very high, to be sure, but it was believed that the reading was lower than it would have been prior to the occurrence of dilatation and consequent feebleness of the left ventricle. Nevertheless, since this conclusion was open to doubt, it seemed the part of wisdom to diagnosticate only the dilatation and myocardial incompetence, leaving the question of degeneration an open one which would probably find answer in the results of treatment.

Treatment falls under two heads, in accordance with the two groups under which the subject has been considered:

Group I. In the cases presenting signs of inadequacy the management should be essentially the same as in waning heart power from any cause. In the second group of cases, on the contrary, treatment should be conservative, that is, designed to prevent the development of incompetence, either through acute strain or through gradual increase of the hypertension already existing and probably responsible for the hypertrophy present.

It would be manifestly impossible within the limits of this paper to enter into a detailed discussion of all the weapons at our disposal in our attempts to combat the foe that has attacked the citadel of life, and hence we should be content to consider only certain of these. We cannot hope to restore the structural integrity of the heart muscle, but instead we should endeavor to improve its potential capacity. To this end the first and indispensable requirement is rest. We cannot expect an overworked organ to regain its lost strength if it is permitted to go on overworking. The degree of rest necessary and the length of time during which this measure is to be enforced should depend largely upon the degree of inadequacy. It is my belief, however, that with the first appearance of myocardial incompetence the individual should be told emphatically that he must give his heart a rest.

When symptoms are mild it may suffice for the patient to remain in his room or on one floor, avoiding stairs and lying down a considerable part of the time; but when it is evident that the heart cannot bear even slight exertion the individual should be made to remain at absolute rest in bed. In some instances it may be necessary even to insist upon freedom from all mental effort of a fatiguing kind and from the excitement of conversation with family and friends. At the best, heart rest can never be complete, and yet as much relief from work as possible must be had in these cases.

As with the rigor of its enforcement, so with the length of time during which this mental and physical rest must be carried out, no fixed rule can be given. This should be determined by the exigencies of each case. But of one thing I feel convinced, namely, that absolute rest in bed for a long time is not as beneficial to a degenerated heart as it is to one which is the seat of valvular disease. For example, in the failing compensation of mitral stenosis it is absolutely necessary to restrict the flow of blood to the right heart by abolishing muscular movements and quieting the respiration. Hence, the patient is kept at complete repose in bed. Conditions are different with an inadequate myocardium, for if the heart is deprived of the aid to venous return residing in muscular contraction and deepened inspiration caused by exercise, it is compelled to carry on the circulation very largely through its propulsive force. For a while, at least, this is offset by the lessened number of its contractions and its greater total period of diastolic repose. But if this rigid rest in the dorsal decubitus be enforced for too long a time the benefit of lengthened diastoles is counteracted, as it seems to me, by several factors that are likely to be forgotten.

In addition to the pumping action exerted upon the contents of the systemic veins by the contractions of the voluntary muscles and diaphragm, which action greatly facilitates intra-abdominal circulation, exercise produces a dilatation of the intermuscular arterioles which causes a derivation of blood to the extremities and thus lightens the heart's work. Muscular exercise also increases the interchange of gases, and hence the supply of oxygen to the tissues, including that of the myocardium. If now muscular inactivity be too prolonged and too rigid in the class of cases now considered, there comes a time when the heart no longer profits by the rest in bed, as may be shown by a tendency to return of the symptoms which had disappeared soon after treatment by rest had been instituted.

Consequently if the heart muscle has not regained sufficient strength to admit of voluntary exercise it must receive the assistance which comes from massage and properly conducted resistance exercises. The former is often of considerable benefit, but should not be applied vigorously to the abdomen on account of the elevation of blood pressure caused by deep manipulation of the abdominal parietes. This portion of the body may be massaged gently, however, and then with benefit. It is often advantageous to have rubbing supplemented by passive rotation and flexion of the joints by the masseur.

It is in this class of cases that resistance exercises find their chief sphere of usefulness. Their modus operandi is not clearly understood, but to my mind their benefit comes from the fact of their supplying the assistance so imperatively needed by the degenerated myocardium, yet without accelerating its contractions as does active voluntary exercise. Certain it is that the degree of benefit to be attained may be measured by the effect upon the heart rate. They prove of valuable aid in the carrying out of the principle of rest in the management of these cases.

In this connection may be mentioned the so-called Nauheim baths. Probably no class of cardiopaths obtain as much benefit from this balneological treatment as do persons suffering from myocardial incompetence apart from valvular disease. Although not at all wishing to be thought an advocate of these baths at home by means of artificial waters in preference to those at Bad-Nauheim, still I believe, from thirteen years of personal experience with the employment of artificial waters, that very striking improvement will follow in many cases, provided the baths are ordered with skill and judgment. I do not approve, however, of the efforts being made by a certain commercial house to introduce their effervescing bath tablets into indiscriminate use, since I am persuaded that their unskilful use may be productive of positive harm.

The rules governing the administration of these saline baths cannot be discussed here, but I wish to emphasize the point that this mode of therapy should not be deferred until cardiac incompetence has become advanced. The sooner it is begun after the appearance of symptoms, the greater is the prospect of improvement. Furthermore, it is well, in most cases, for the patients to take a course of baths annually, since a degenerated heart which once has shown signs of inadequacy requires frequent and repeated bolstering.

Medicinal agents must receive but scant attention in this paper, since for the most part their administration is governed by the rules that apply to cases of decompensated valvular disease. The use of vasodilators can rarely be omitted, especially when the arteries are stiff, but I should like to emphasize the point that they should never be neglected when digitalis is being administered in a case showing pronounced hypertension together with myocardial incompetence.

Digitalis and its congeners may likewise be passed by with but very few words. They are probably indispensable at some time in this group of cases, but are to be handled with care and judgment and require careful watching.

Theoretically, strophanthus is the drug which should yield the happiest results in these cases, and I have often been much pleased with its effects. Nevertheless no one cardiac tonic is equally suitable to all cases, and it is actual trial that must serve as the guide.

Formerly, from theoretical considerations, I was strongly opposed to the employment of aconite in cardiac disease. Experience has convinced me, however, of its great utility in some cases of myocardial degeneration characterized by great hypertrophy together with dilatation. In such cases tincture of aconite controls the uncomfortable sense of palpitation which annoys some patients. When, on the contrary, the heart chambers are greatly dilated and inadequate, I believe this remedy is not beneficial, if indeed it be not positively harmful.

Cathartics form a class of medicinal agents which deserve special attention. Although capable of doing harm when pushed to the extreme for too long a time, I yet believe they are employed too gingerly by most practitioners. Whenever the portal system is much engorged, cathartics are indispensable. Stasis within the great intra-abdominal vessels acts as a dam to the circulation. Under such circumstances the heart is obliged to propel the blood stream against a barrier. To remove this hindrance we must either bleed or purge, and as frequent loss of blood by venesection would be disastrous we must administer cathartics.

These should be bland and unirritating, and a saline is ordinarily the best. Sulphate of magnesium answers very well in many cases, but my preference is for some aperient water containing sulphate of sodium as well as magnesium. The correct principle of its employment, in my opinion, is to administer the cathartic daily, because, in the first place, an individual with a degenerated myocardium should never be allowed to strain at stool, on account of his liability to dilate his ventricle, and, in the second place, since the main reason of the cathartic is to keep down portal stasis, its action should be continuous, so to speak, or, in other words, daily and not at considerable intervals. The tendency to stasis is ever present, and if attacks upon it are spasmodic and unsystematic, as it were, the vessels will remain engorged or become more so in spite of us.

As long as pulse tension is high, as in the cases of cardiac inadequacy associated with chronic nephritis, the cathartic affords relief, because it removes intestinal toxins as well as lessens resistance in the great intra-abdominal vessels and thus facilitates the work of the heart. When, on the contrary, blood pressure has become low and dilatation is predominant the daily purge brings relief, because of its diminishing the ever-growing engorgement of the abdominal viscera. It is indispensable, therefore, in all cases of degeneration with consequent insufficiency of the myocardium.

Finally, a few words in regard to the use of morphine in this class of cases. Few therapeutic agents are of as positive value as is this, when properly administered. Its chief merit consists in its ability to relieve the attacks of dyspnœa (cardiac asthma), which so often rob these cardiopaths of needed rest. Given in a small dose subcutaneously, $\frac{1}{10}$ to $\frac{1}{8}$ grain, late in the evening, morphine acts as an efficient heart stimulant and almost without exception will ward off the dyspnœa. In many persons it also exerts a satisfactory hypnotic influence and brings the much-needed repose and refreshment. Were this the only service rendered by this remedy it would make the agent well-nigh indispensable. But when administered in a small daily dose and in the manner recommended, morphine becomes a positive tonic to the inadequate heart and contributes powerfully to restoration of potential strength and prolongs life when recovery is impossible.

In the majority of cases a dose larger than $\frac{1}{8}$ grain is not necessary, and hence I regard it as a mistake to begin with $\frac{1}{4}$ grain, as is so often done. It is my invariable rule to follow the morphine next morning with a cathartic containing sodium, and when the bowels are kept open by this means I have rarely seen intolerance of the drug. I have known cases in which $\frac{1}{8}$ grain was administered hypodermically every evening for many weeks without the necessity of increasing the dose.

I have recently resorted to the hypodermic use of $\frac{1}{12}$ to $\frac{1}{6}$ grain of heroine for the relief of nocturnal dyspnœa, and have seen it followed by almost miraculous relief when such had not been obtained by morphine. I have never observed the same results from the use of morphine or opium by the mouth as by subcutaneous injection. The objection that dependence upon morphine may become a fixed habit is of no weight in a case of incurable heart disease, which, if restored to some degree of competence, yet cannot last for many years and oftentimes for not more than a few months.

Group II. The management of this class of patients contemplates not the restoration of cardiac sufficiency, since this has not been lost, but its preservation. In other words, treatment is now preventive, so far as such is possible. By the time the existence of myocardial degeneration is recognizable or at least presumable, it is probably too late to do aught toward its restriction, and, therefore, the aim of management must be to protect the weakened myocardium against injurious influences and to assist it in its struggle to maintain the circulation.

Our first duty, therefore, is to inform the individual of the exact state of affairs, lest if left in the belief that all is well with him he fail to co-operate by strict obedience to injunctions. Next, he must be warned of the danger attached to activities which involve heart strain and hence the liability to dilatation. Running to catch trains, the hasty ascent of long flights of stairs, arduous mountain climbing, the lifting and carrying of heavy weights, as hand-baggage, business activities involving much excitement or fatigue, etc., must be avoided. Absolute freedom from all injurious influences of this kind may not be practicable, and yet very much can be done in this direction by the person who is impressed with the harm that is likely to ensue.

The prevention of acute heart strain, important as it is, is in reality subordinate to prophylaxis as regards chronic overtaxing of cardiac power. This latter is brought about through the persistence or perchance increase of the hypertension so commonly seen in these cases. Prevention calls, therefore, for correction of all those factors of overfeeding, lack of exercise, and strenuous business life which make for high blood pressure and consequent augmentation of peripheral resistance.

In particular I wish to dwell on the value for these individuals of systematic and regulated medical gymnastics. These consist of breathing exercises, arm and leg movements, and contractions of the abdominal muscles, conducted in the presence, under the supervision, and by the assistance of a skilled medical gymnast, who keeps careful watch of the pulse and respiration, lest the exercises be so violent as to cause circulatory or respiratory embarrassment. The heart laboring against high blood pressure may be readily overstrained, but if, on the contrary, the exercises are at first light and easy the heart becomes accustomed to them and will at length bear vigorous physical efforts without undue acceleration of the pulse.

I doubt the wisdom of allowing an individual to carry out such a system of exercises alone, unless indeed the physician be certain of the potential integrity of the heart muscle and of the person's judgment. After the patient has learned the proper method of exercise and the amount of physical effort which his heart will endure, he may continue them without further assistance and direction by the gymnast.

Along the same line are golf, horseback riding, walking, the so-called terrain-kur of Oertel, light dumb-bell exercises, the sawing and splitting of wood, etc. The younger the individual and the greater the likelihood of a still elastic aorta and competent myocardium the more vigorous may be the daily exercise. But in all instances the physician should maintain supervision of the individual until convinced of the benefit and not harm resulting from the physical exercise. If the person displays the initial symptoms of myocardial inadequacy he should be permitted nothing more severe than the resistance exercises already advised for the cases in the first group.

Medicinal treatment has but small place in the management of these cases. The keynote of the situation is change of habits and the institution of a hygienic mode of life. Nevertheless a certain amount of drug therapy may be of service. If pulse tension is high and abdominal corpulence bespeaks high intra-abdominal blood pressure, cathartics are of great value. In such cases the work of the heart is materially assisted by an occasional brisk purge by calomel and a saline or the compound infusion of senna. In all patients displaying habitual constipation this should be corrected, as straining at stool greatly augments the harm resulting from the constipation. An occasional course of the laxative waters of some spa, as Carlsbad, West Baden, French Lick, or elsewhere, may prove very beneficial.

The administration of vasodilators is indicated only in those cases which display such an excess of arterial tension that it is but a question of short time before the heart muscle must yield to the strain. When such a dire event is imminent the various measures just advocated must be carried out promptly and with judgment, since delay and indiscretion may be tantamount to the proverbial locking of the barn-doors after the horses have been stolen.

A PROPER SHOE AS AN AID TO TREATMENT IN FLAT (OR WEAKENED) FEET.

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There is considerable confusion and misunderstanding in the minds of many of the profession in regard to flat-foot. The term as applied in many instances is misleading. The weakened foot goes through a series of changes, beginning with a disability known as pronated foot and ending with the deformity of rigid flat-foot (Figs. 1 to 7). The term flat-foot cannot be used to designate all the stages of this trouble, but should be restricted to one phase of the progressive weakened condition.

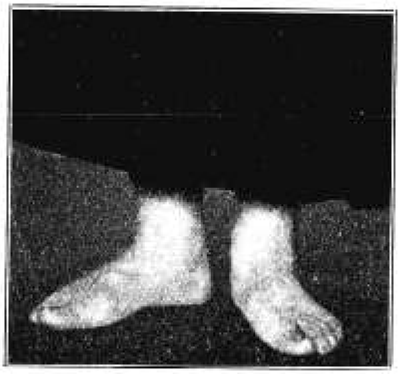

Fig. 1.—Weak and painful foot; slight pronation; arch not obliterated by weight-bearing.

Recently[1] I discussed the series as regards etiology, symptoms, diagnosis, and treatment, and stated that two of the chief aids to treatment are a proper brace and a proper shoe. Subsequently[2] I discussed fully the indications for a brace and described a form of brace which had been found useful in these weakened conditions. In the present article I wish to point out some of the advantages of a proper shoe, and describe its form and manufacture.

[1] Albany Med. Annals, April, 1906.

[2] Ibid., September, 1906.